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EXAMINER	
WANG, VICTOR W	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/711,901	SPIERS ET AL.	
	Examiner	Art Unit	
	Victor W. Wang	2189	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 October 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5,8-38,41-56 and 58-63* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,8-38,41-56 and 58-63* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 October 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This office action has been issued in response to amendment filed 5 October 2007. All objections and rejections not repeated below are withdrawn. Applicant's arguments have been carefully and respectfully considered, but they have not been found persuasive, even in light of the instant amendments. Accordingly, this action has been made FINAL.

Claim Objections

2. Claims 27-28, 41 objected to because of the following informalities:

As per claims 27-28, the Applicant has indicated that claims 27-28 have been amended. However, the Examiner notes no amendments are presented in these claims. Appropriate correction is required.

As per claim 41, dependent claim 41 is a duplicate of dependent claim 8, with both claims dependent upon independent claim 1. It appears to the Examiner that claim 41 is meant to be dependent upon independent claim 35, and is treating claim 41 as such. Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. **Claims 1-3, 8-13, 16, 20, 35-36, 41-44, 47, 50, 52-54, 58 and 61** are rejected under 35 U.S.C. 103(a) as unpatentable over Brant (US 5799200).

As per claim 1, Brant discloses "A data storage system comprising: a first data storage device comprising a first data storage device memory for holding data;" **[With respect to this limitation, Brant discloses "a multiplicity of disks" (column 3, line 49-50), "system appears to the remote computer as a single, large capacity, disk storage device" (column 3, line 61-62)];**

"a second data storage device comprising: a second data storage device volatile memory;" **[With respect to this limitation, Brant discloses "a single module containing both a DRAM and a Flash ROM" (column 2, line 19-21)];**

"a second data storage device non-volatile memory;" **[With respect to this limitation, Brant discloses "a single module containing both a DRAM and a Flash ROM" (column 2, line 19-21)];**

"and a processor for causing a copy of data provided to said first data storage device to be provided to said second data storage device volatile memory, and in the event of a power interruption moving said data from said second data storage device volatile memory to said second data storage device non-volatile memory;" **[With respect to this limitation, Brant discloses "Commands and data from the remote system are received by the interface devices 18A and 18B at terminals 19A and 19B which stores whatever is received in DRAM units 16 and 17 described below" (column 3, line 62-65), "Thus, the power loss detection**

triggers a transfer of the data contained in the dynamic random access memory into the Flash ROM" (column 2, line 47-49), "local controller" (column 6, line 36) and Fig. 2. It is understood that from the remote computer's perspective, there is a first data storage comprised of a multiplicity of disks and a second data storage containing both a DRAM and a Flash ROM. It is also inherently apparent that a set of data is provided by the remote computer to both the first data storage and the second data storage]

"and a second power source comprising a capacitor for providing power to transfer data from said second data storage device volatile memory to said second data storage device non-volatile memory" as **["a battery 52 is included as part of the module 17 to control the logic 54 and other circuitry to transfer the DRAM 51 memory contents into the Flash ROM 55 upon loss of primary power" (column 5, lines 29-32)]**; but fails to disclose expressly that the second power source is a capacitor.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to determine to modify Brant system where the second power source is a battery, and determine that the second power source is a capacitor. The motivation for doing so would have been because using a capacitor is one of a finite number of ways to provide backup power to a circuit system.

As per claim 35, Brant discloses "A method for storing data in a data storage system, comprising: providing a first data storage device comprising a first memory for holding data;" as **[With respect to this limitation, Brant discloses "a multiplicity of disks" (column 3, line 49-**

50), "system appears to the remote computer as a single, large capacity, disk storage device" (column 3, line 61-62)]

"providing a second data storage device comprising a second volatile memory and a second non-volatile memory and a second power source comprising ... for providing power to transfer data from said second volatile memory to said second non-volatile memory;" as **["a single module containing both a DRAM and a Flash ROM" (column 2, line 19-21), "a battery 52 is included as part of the module 17 to control the logic 54 and other circuitry to transfer the DRAM 51 memory contents into the Flash ROM 55 upon loss of primary power" (column 5, lines 29-32)];**

"storing said data to be stored at said first data storage device at said second data storage device in said second volatile memory;" as **["Commands and data from the remote system are received by the interface devices 18A and 18B at terminals 19A and 19B which stores whatever is received in DRAM units 16 and 17 described below" (column 3, line 62-65), "Thus, the power loss detection triggers a transfer of the data contained in the dynamic random access memory into the Flash ROM" (column 2, line 47-49), "local controller" (column 6, line 36) and Fig. 2. It is understood that from the remote computer's perspective, there is a first data storage comprised of a multiplicity of disks and a second data storage containing both a DRAM and a Flash ROM. It is also inherently apparent that a set of data is provided by the remote computer to both the first data storage and the second data storage]**

"and moving, using power provided... said data from said second volatile memory to said second non-volatile memory in the event of a power interruption." as **["a battery 52 is included**

as part of the module 17 to control the logic 54 and other circuitry to transfer the DRAM 51 memory contents into the Flash ROM 55 upon loss of primary power" (column 5, lines 29-32)]; but fails to disclose expressly that the second power source is a capacitor.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to determine to modify Brant system where the second power source is a battery, and determine that the second power source is a capacitor. The motivation for doing so would have been because using a capacitor is one of a finite number of ways to provide backup power to a circuit system.

As per claims 2 and 36, Brant discloses "wherein said first data storage device comprises at least one hard disk drive." **[With respect to this limitation, Brant discloses "a multiplicity of disks" (column 3, line 49-50), "system appears to the remote computer as a single, large capacity, disk storage device" (column 3, line 61-62)].**

As per claim 3, Brant discloses "wherein said first data storage device comprises a plurality of hard disk drives." **[With respect to this limitation, Brant discloses "a multiplicity of disks" (column 3, line 49-50), "system appears to the remote computer as a single, large capacity, disk storage device" (column 3, line 61-62)].**

As per claims 8 and 41, Brant discloses "wherein said secondary power source comprises a battery." **[With respect to this limitation, Brant discloses "At most, a small battery as an auxiliary power source" (column 2, lines 30-32)].**

As per claim 9, Brant discloses "said second data storage device, upon detection of a power interruption, switches to said secondary power source and receives power from said secondary power source while moving said data from said second data storage device volatile memory to said second data storage device non-volatile memory." **[With respect to this limitation, Brant discloses "Thus, the power loss detection triggers a transfer of the data contained in the dynamic random access memory into the Flash ROM" (column 2, line 47-49), and "at most, a small battery as an auxiliary power source is used which only is active long enough to move data from the DRAM to the Flash ROM" (column 2, line 30-32)].**

As per claim 10, Brant discloses "The data storage system, as claimed in claim 9, wherein upon completion of moving said data from said second data storage device volatile memory to said second data storage device non-volatile memory, said second data storage device discontinues receiving power from said secondary power source." **[With respect to this limitation, Brant discloses "After data is recovered from Flash ROM 55 to DRAM 51, local controller 54, pursuant to the FIG. 5 process, inspects to see if controllers 10, 14 or 15 have generated an Erase command. If so, the Flash ROM 55 is erased and ready to receive new data. The Last Save OK bit is also cleared at this point. Battery 52 is only used as long as absolutely necessary at two times. The first is upon initialization to flash the Flash ROM 55. The second is when primary power is lost, at which time battery 52 is employed to save the data. Immediately thereafter, the battery 52 is turned off so as to avoid draining it" (column 6, lines 52-65)].**

As per claim 11, Brant discloses "The data storage system, as claimed in claim 1, wherein said second data storage device non-volatile memory comprises an electrically erasable programmable read-only-memory." **[With respect to this limitation, Brant discloses "a single module containing both a DRAM and a Flash ROM" (column 2, line 20-21), "The Flash ROM 55 is a non-volatile RAM or electrically erasable PROM with appropriate densities" (column 5, lines 32-34) where it is understood that the DRAM is the volatile memory and the Flash ROM is the non-volatile memory].**

As per claim 12, Brant discloses "The data storage system, as claimed in claim 11, wherein said second data storage device volatile memory comprises a random access memory." **[With respect to this limitation, Brant discloses "a single module containing both a DRAM and a Flash ROM" (column 2, line 20-21) where it is understood that the DRAM is the volatile memory and the Flash ROM is the non-volatile memory].**

As per claim 13, Brant discloses "The data storage system, as claimed in claim 1, wherein said processor, upon detection of a power interruption, reads said data from said second data storage device volatile memory, writes said data to said second data storage device non-volatile memory, and verifies that said data stored in said second data storage device non-volatile memory is correct." **[With respect to this limitation, Brant discloses "upon a power failure, a dump from the DRAM 51 to the Flash ROM 55 is effected" (column 6, line 24-25), and**

"Local controller 54 stores a "Save OK" bit on the Flash ROM 55 when it determines that a successful dump of the contents of DRAM 51 into Flash ROM 55 occurred. As seen in FIG. 5, the first thing that local controller 54 does is to check to see if the Save OK bit is set reflecting that data was previously saved in the Flash ROM 55 suitable for recovery" (column 6, line 36-41)].

As per claim 16, Brant discloses "The data storage system, as claimed in claim 1, wherein said first data storage device and said second data storage device are operably interconnected to a storage server, said storage server operable to cause data to be provided to each of said first and second data storage devices." **[With respect to this limitation, Brant discloses "The system of FIG. 1 has dual, redundant Application Specific Integrated Circuit (or ASIC) modules 14 and 15, and a plurality of Small Computer System Interface (SCSI) devices 21-24 and 31-34, all of which are similarly coupled into buses 11 and 12. The configurations of these buses are well known in the industry. They are sufficiently defined that many systems are configured with chips that plug directly onto them, or in some cases, the chips are positioned on boards and attached to the bus via wires. A plurality of disks, such as 25-28 and 35-38, are coupled through the SCSI interface devices 25-28 and 35-38 into the buses 11 and 12. The pair of ASIC modules 14 and 15 each functions as a controller in response to processor 10 for interfacing with a pair of redundantly coupled Dynamic Random Access Memory (DRAM) modules 16 and 17" (column 4, line 5-19), and "Commands and data from the remote system are received by the interface devices 18A and 18B at**

terminals 19A and 19B which stores whatever is received in DRAM units 16 and 17 described below" (column 3, line 62-66)].

As per claim 20, Brant discloses "The data storage system, as claimed in claim 1, wherein said processor, following restoration of power after the power interruption, moves said data from said second data storage device non-volatile memory to said second data storage device volatile memory." **[With respect to this limitation, Brant discloses "Once it is recognized that the primary power source is again supplying power to the system, the method in accordance with the present invention includes the step of returning the data from the Flash ROM to the original DRAM" (column 3, line 8-11)].**

As per claim 42, Brant discloses "The method, as claimed in claim 1, wherein said moving step comprises: switching said second memory device to said secondary power source;" **[With respect to this limitation, Brant discloses "At most, a small battery as an auxiliary power source" (column 2, lines 30-32)].**

"reading said data from said second data storage device volatile memory;" **[With respect to this limitation, Brant discloses "Thus, the power loss detection triggers a transfer of the data contained in the dynamic random access memory into the Flash ROM" (column 2, line 47-49), where it is readily apparent that a transfer of data involve both reading and writing data];**

"and writing said data to said second data storage device non-volatile memory."

[With respect to this limitation, Brant discloses "Thus, the power loss detection triggers a transfer of the data contained in the dynamic random access memory into the Flash ROM" (column 2, line 47-49), where it is readily apparent that a transfer of data involve both reading and writing data];

As per claim 43, Brant discloses "The method, as claimed in claim 1, wherein said moving step further comprises: switching said second memory device off of said secondary power source following said writing step." **[With respect to this limitation, Brant discloses "After data is recovered from Flash ROM 55 to DRAM 51, local controller 54, pursuant to the FIG. 5 process, inspects to see if controllers 10, 14 or 15 have generated an Erase command. If so, the Flash ROM 55 is erased and ready to receive new data. The Last Save OK bit is also cleared at this point. Battery 52 is only used as long as absolutely necessary at two times. The first is upon initialization to flash the Flash ROM 55. The second is when primary power is lost, at which time battery 52 is employed to save the data. Immediately thereafter, the battery 52 is turned off so as to avoid draining it" (column 6, lines 52-65)].**

As per claim 44, Brant discloses "The method, as claimed in claim 35, wherein said moving step comprises: detecting a power interruption;" **[With respect to this limitation, Brant discloses "the power loss detection triggers a transfer of the data contained in the dynamic random access memory into the Flash ROM" (column 2, line 47-49), where it is readily understood that a transfer of the data involves reading data from volatile memory and writing data to non-volatile memory];**

"reading said data from said second data storage device volatile memory;" **[With respect to this limitation, Brant discloses "the power loss detection triggers a transfer of the data contained in the dynamic random access memory into the Flash ROM" (column 2, line 47-49), where it is readily understood that a transfer of the data involves reading data from volatile memory and writing data to non-volatile memory];**

"writing said data to said second data storage device non-volatile memory;" **[With respect to this limitation, Brant discloses "the power loss detection triggers a transfer of the data contained in the dynamic random access memory into the Flash ROM" (column 2, line 47-49), where it is readily understood that a transfer of the data involves reading data from volatile memory and writing data to non-volatile memory];**

"and verifying that said data stored in said second data storage device non-volatile memory is correct." **[With respect to this limitation, Brant discloses "upon a power failure, a dump from the DRAM 51 to the Flash ROM 55 is effected" (column 6, line 24-25), and "Local controller 54 stores a "Save OK" bit on the Flash ROM 55 when it determines that a successful dump of the contents of DRAM 51 into Flash ROM 55 occurred. As seen in FIG. 5, the first thing that local controller 54 does is to check to see if the Save OK bit is set reflecting that data was previously saved in the Flash ROM 55 suitable for recovery" (column 6, line 36-41)].**

As per claim 47, Brant discloses "The method, as claimed in claim 35, further comprising: providing a block data storage controller operably interconnected to said first and second data storage devices." **[With respect to this limitation, Brant discloses "The system of**

FIG. 1 has dual, redundant Application Specific Integrated Circuit (or ASIC) modules 14 and 15, and a plurality of Small Computer System Interface (SCSI) devices 21-24 and 31-34, all of which are similarly coupled into buses 11 and 12. The configurations of these buses are well known in the industry. They are sufficiently defined that many systems are configured with chips that plug directly onto them, or in some cases, the chips are positioned on boards and attached to the bus via wires. A plurality of disks, such as 25-28 and 35-38, are coupled through the SCSI interface devices 25-28 and 35-38 into the buses 11 and 12. The pair of ASIC modules 14 and 15 each functions as a controller in response to processor 10 for interfacing with a pair of redundantly coupled Dynamic Random Access Memory (DRAM) modules 16 and 17" (column 4, line 5-8)].

As per claim 50, Brant discloses "The method, as claimed in claim 35, further comprising: detecting a power restoration after the power interruption;" **[With respect to this limitation, Brant discloses "Once it is recognized that the primary power source is again supplying power to the system" (column 3, line 8-11)];**

"and secondly moving said data from said second non-volatile memory to said second volatile memory." **[With respect to this limitation, Brant discloses "the method in accordance with the present invention includes the step of returning the data from the Flash ROM to the original DRAM" (column 3, line 8-11)].**

As per claim 52, Brant discloses "The method, as claimed in claim 50, wherein said step of providing a first data storage device comprises providing a plurality of data storage devices

each having an identification stored thereon identifying said second data storage device, and wherein the method further comprises: writing said data stored at said second data storage device volatile memory to said hard disk drives when said identification is present on all of said hard disk drives, and generating an error when said identification is not present on all of said hard disk drives." **[With respect to this limitation, Brant discloses "a multiplicity of disks" (column 3, line 49-50), "the placing of a sequence number on the disk 58. The sequence number is written only by one controller 14 or 15 during initialization. Thereafter, this unique sequence number resides in both the Flash ROM 55, and on the disk 58 which is readable by both controllers 14 and 15" (column 7, line 29), "controller recovers its local data, writes that to the disk... it finds it has write data, and the way it finds out that data was recovered already or not is by checking the sequence numbers" (column 7, line 51-58) where it is understood that recovering local data involves writing data stored in backup memory into hard disk drives, and "if they do not match, the controller recognizes that the system was already recovered" (column 8, lines 4-5)].**

As per claim 53, Brant discloses "A data storage system comprising: a primary data storage device comprising a primary memory for holding data;" **[With respect to this limitation, Brant discloses "a multiplicity of disks" (column 3, line 49-50), "system appears to the remote computer as a single, large capacity, disk storage device" (column 3, line 61-62)].**

"a backup data storage device comprising: a backup volatile memory, a backup non-volatile memory, a backup power source... for providing power to transfer data from said backup

volatile memory to said backup non-volatile memory, and a processor operable to: cause a copy of data provided to said primary data storage device to be provided to said backup volatile memory;" **[With respect to this limitation, Brant discloses "A single module containing both a DRAM and a Flash ROM works to automatically preserve data in the event electrical power is lost from a primary power source. Data is moved from the DRAM to the Flash ROM where it remains as long as power is not available from the primary source" (column 2, line 19-23), "a battery 52 is included as part of the module 17 to control the logic 54 and other circuitry to transfer the DRAM 51 memory contents into the Flash ROM 55 upon loss of primary power" (column 5, lines 29-32)];**

"and upon detection of a power interruption, move said data from said backup volatile memory to said backup non-volatile memory and verify the accuracy of the data stored in said ... backup non-volatile memory using power supplied by said backup power source." **[With respect to this limitation, Brant discloses "Thus, the power loss detection triggers a transfer of the data contained in the dynamic random access memory into the Flash ROM" (column 2, line 47-49), "a remote data processor" (column 12, line 5), "an auxiliary batter power source" (column 13, line 21), "Local controller 54 stores a "Save OK" bit on the Flash ROM 55 when it determines that a successful dump of the contents of DRAM 51 into Flash ROM 55 occurred. As seen in FIG. 5, the first thing that local controller 54 does is to check to see if the Save OK bit is set reflecting that data was previously saved in the Flash ROM 55 suitable for recovery" (column 6, line 36). It is understood that from the remote computer's perspective, there is a first data storage comprised of a multiplicity of disks and a second data storage containing both a DRAM and a Flash ROM. It is also inherently apparent**

that a set of data is provided by the remote computer to both the first data storage and the second data storage]; but fails to disclose expressly that the second power source is a capacitor.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to determine to modify Brant system where the second power source is a battery, and determine that the second power source is a capacitor. The motivation for doing so would have been because using a capacitor is one of a finite number of ways to provide backup power to a circuit system.

As per claim 54, Brant discloses "The data storage system, as claimed in claim 53, wherein said primary data storage device comprises at least one hard disk drive." **[With respect to this limitation, Brant discloses "a multiplicity of disks" (column 3, line 47), "system appears to the remote computer as a single, large capacity, disk storage device" (column 3, line 61-62)].**

As per claim 58, Brant discloses "The data storage system, as claimed in claim 53, wherein said backup data storage device non-volatile memory comprises an electrically erasable programmable read-only-memory, and said backup data storage device volatile memory comprises a random access memory." **[With respect to this limitation, Brant discloses "a single module containing both a DRAM and a Flash ROM" (column 2, line 20-21), "The Flash ROM 55 is a non-volatile RAM or electrically erasable PROM with appropriate densities" (column 5, lines 32-34) where it is understood that the DRAM is the volatile memory and the Flash ROM is the non-volatile memory].**

As per claim 61, Brant discloses "The data storage system, as claimed in claim 53, wherein said primary data storage device and said backup data storage device are operably interconnected to a block data storage server, said storage server operable to cause data to be provided to each of said primary and backup data storage devices." **[With respect to this limitation, Brant discloses "The system of FIG. 1 has dual, redundant Application Specific Integrated Circuit (or ASIC) modules 14 and 15, and a plurality of Small Computer System Interface (SCSI) devices 21-24 and 31-34, all of which are similarly coupled into buses 11 and 12. The configurations of these buses are well known in the industry. They are sufficiently defined that many systems are configured with chips that plug directly onto them, or in some cases, the chips are positioned on boards and attached to the bus via wires. A plurality of disks, such as 25-28 and 35-38, are coupled through the SCSI interface devices 25-28 and 35-38 into the buses 11 and 12. The pair of ASIC modules 14 and 15 each functions as a controller in response to processor 10 for interfacing with a pair of redundantly coupled Dynamic Random Access Memory (DRAM) modules 16 and 17" (column 4, line 5-19), and "Commands and data from the remote system are received by the interface devices 18A and 18B at terminals 19A and 19B which stores whatever is received in DRAM units 16 and 17 described below" (column 3, line 62-66)].**

5. Claims 4-5, 37-38 and 55-56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brant (US 5799200) as applied to claims 1-3, 8-13, 16, 20, 35-36, 41-44, 47, 50, 52-54, 58 and 61 above, and further in view of Jones (US 2002/0156983).

As per claims 4, 37 and 55 Brant discloses "wherein said first data storage device memory comprises a ... storage media capable storing said data." **[With respect to this limitation, Brant discloses "apparatus for preserving data that is stored in a volatile manner in a data processing system... employing a first volatile dynamic random access memory for storing said data" (column 11, line 14-19)]**; but fails to disclose expressly "volatile write-back cache".

Jones discloses "volatile write-back cache" **[With respect to this limitation, Jones discloses "write back cache" (paragraph 000, line 2), where it is understood that the cache is volatile].**

Brant and Jones are analogous art because they are from the same field of endeavor of data recovery between volatile and non-volatile storage system.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data storage system where upon power interruption, copy data from a first volatile memory to a second non-volatile memory as described by Brant and determine to use a write-back cache as the volatile memory as taught by Jones.

The motivation for doing so would have been because Jones teaches that **"write back caches improve performance, because a write to the high-speed cache is faster than to the storage device" (paragraph 0004, line 7-9).**

As per claims 5, 38, and 56 Brant discloses "wherein said first data storage device, upon receiving data to be stored on said storage media, stores said data in said volatile write-back cache and generates an indication that said data has been stored at said first data storage device

before storing said data on said media." **[With respect to this limitation, Brant discloses "The system appears to the remote computer as a single, large capacity, disk storage device. Commands and data from the remote system are received by the interface devices 18A and 18B at terminals 19A and 19B which stores whatever is received in DRAM units 16 and 17 described below. Interface devices 18 then notify the processor 10 that these commands and/or data are stored" (column 3, line 60-67)];** but fails to disclose expressly "volatile write-back cache".

6. Claims 14, 45 and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brant (US 5799200) as applied to claims 1-3, 8-13, 16, 20, 35-36, 41-44, 47, 50, 52-54, 58 and 61 above, and further in view of Asoh (US 2001/0002479).

As per claim 14, 45 and 59, Brant fails to disclose expressly "wherein said processor verifies that said data stored in said second data storage device non-volatile memory is correct by comparing said data from said second data storage device non-volatile memory with said data from said second data storage device volatile memory, and re-writing said data to said second data storage device non-volatile memory when the comparison indicates that the data is not the same."

Asoh discloses "wherein said processor verifies that said data stored in said second data storage device non-volatile memory is correct by comparing said data from said second data storage device non-volatile memory with said data from said second data storage device volatile memory, and re-writing said data to said second data storage device non-volatile memory when the comparison indicates that the data is not the same." **[With respect to this limitation, Asoh**

discloses "At step S112, the non-volatile memory manager 34 reads out a newly-written data from the sector corresponding to the sector address set in the sector address register of the non-volatile memory control circuit 26 at step S108, and compares it with the writing objective data set in the writing register. Then, if both do not coincide, the non-volatile memory manager 34 judges that data is not correctly written in the sector and advances the processing to step S113" (paragraph 0113)].

Brant and Asoh are analogous art because they are from the same field of endeavor of data backup.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system wherein upon power interruption, copy data from a first volatile memory to a second non-volatile memory as described by Brant and determine to verify data scored in the memories by comparing the two memories as taught by Asoh.

The motivation for doing so would have been because Asoh teaches that **"even if a power interruption occurs while data is input from the host computer to the IC card, data inside the main area is never destroyed and data inside the main area can be restored based on data remaining in the temporary storage area" (abstract, line 9-13).**

7. Claims 15, 21, 46, 51 and 60 rejected under 35 U.S.C. 103(a) as being unpatentable over Brant (US 5799200) as applied to claims 1-3, 8-13, 16, 20, 35-36, 41-44, 47, 50, 52-54, 58 and 61 above, and further in view of Chambers (US 2004/0138855).

As per claims 15, 46, and 60, Brant discloses "wherein said processor, upon detection of a power interruption, reads said data from said second data storage device volatile memory"

[With respect to this limitation, Brant discloses "the power loss detection triggers a transfer of the data contained in the dynamic random access memory into the Flash ROM" (column 2, line 47-49), where it is readily understood that a transfer of the data involves reading data from volatile memory]; but fails to disclose "computes an ECC for said data, and writes said data and said ECC to said second data storage device non-volatile memory."

Chambers discloses "computes an ECC for said data, and writes said data and said ECC to said second data storage device non-volatile memory." **[With respect to this limitation, Chambers discloses "whenever each version of the data word is backed up to the non-volatile memory, an associated error correction code ('ECC') is computed and backed up along with the data word" (paragraph 0041, line 1-4)].**

Brant and Chambers are analogous art because they are from the same field of endeavor of data backup.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system wherein upon power interruption, copy data from a first volatile memory to a second non-volatile memory as described by Brant and determine to calculate ECC for data read from volatile memory and write ECC along with data into non-volatile memory as taught by Chambers .

The motivation for doing so would have been because Chambers teaches that **"in this way, even if the back up proves unsuccessful it will not overwrite a valid version. Thus, there will always be a valid version of the data word preserved in the non-volatile memory" (paragraph 0013, line 14-17).**

Therefore, it would have been obvious to combine Chambers with Brant for the benefit of having accurate backup data in a storage system as specified in claims 15, 46 and 60.

As per claim 21, Brant discloses "The data storage system, as claimed in claim 20" **[With respect to this limitation, see rejection to claim 20 above].** Brant further discloses "wherein said processor upon detection of the power restoration, reads said data from said second data storage device non-volatile memory" **[With respect to this limitation, Brant discloses "Once it is recognized that the primary power source is again supplying power to the system, the method in accordance with the present invention includes the step of returning the data from the Flash ROM to the original DRAM" (column 3, line 8-11)];** but fails to disclose "computes an ECC for said data, and compares said ECC to a stored ECC read from said second data storage device non-volatile memory."

Chambers discloses "computes an ECC for said data, and compares said ECC to a stored ECC read from said second data storage device non-volatile memory." **[With respect to this limitation, Chambers discloses "The controller then checks the validity of the retrieved N-bit data word by computing its ECC as ECCR and comparing it to the retrieved ECCM. If the two ECCs match, the retrieved N-bit data word is valid and is restored to the power-on register 110." (paragraph 0067, line 7-11)].**

Brant and Chambers are analogous art because they are from the same field of endeavor of data backup.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system wherein upon power interruption, copy data from a first

volatile memory to a second non-volatile memory and upon power restoration to copy the saved data back into the volatile memory as described by Brant and determine to compare the ECC values to determine if the saved data is correct as taught by Chambers .

The motivation for doing so would have been because Chambers teaches that **"in this way, even if the back up proves unsuccessful it will not overwrite a valid version. Thus, there will always be a valid version of the data word preserved in the non-volatile memory" (paragraph 0013, line 14-17).**

Therefore, it would have been obvious to combine Chambers with Brant for the benefit of having accurate backup data in a storage system as specified in claim 21.

As per claim 51, Brant discloses "The method, as claimed in claim 50, wherein said secondly moving step comprises: reading said data from said second data storage device non-volatile memory; **[With respect to this limitation, Brant discloses "a transfer of the data contained in the dynamic random access memory into the Flash ROM" (column 2, line 47-49), where it is readily understood that a transfer of the data involves reading data from volatile memory];** but fails to disclose expressly "computing an ECC for said data; comparing said ECC to stored ECC stored at said second data storage device non-volatile memory; and writing said data to said second data storage device volatile memory when said comparing step indicates said ECC and stored ECC are the same, and generating an error when said comparing step indicates said ECC and stored ECC are not the same."

Chambers discloses "computing an ECC for said data;" **[With respect to this limitation, Chambers discloses "The controller then checks the validity of the retrieved N-bit data**

word by computing its ECC as ECCR and comparing it to the retrieved ECCM" (paragraph 0067, line 7-11)];

"comparing said ECC to stored ECC stored at said second data storage device non-volatile memory;" **[With respect to this limitation, Chambers discloses "The controller then checks the validity of the retrieved N-bit data word by computing its ECC as ECCR and comparing it to the retrieved ECCM" (paragraph 0067, line 7-11)];**

"and writing said data to said second data storage device volatile memory when said comparing step indicates said ECC and stored ECC are the same, and generating an error when said comparing step indicates said ECC and stored ECC are not the same." **[With respect to this limitation, Chambers discloses "If the two ECCs match, the retrieved N-bit data word is valid and is restored to the power-on register 110" (paragraph 0067, line 7-11), "when one of the versions is invalid, the selected version is incremented with an additional count (paragraph 0089, line 1-2)].**

Brant and Chambers are analogous art because they are from the same field of endeavor of data backup.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system wherein upon power interruption, copy data from a first volatile memory to a second non-volatile memory as described by Brant and determine to calculate ECC for data read from volatile memory and write ECC along with data into non-volatile memory as taught by Chambers .

The motivation for doing so would have been because Chambers teaches that **"in this way, even if the back up proves unsuccessful it will not overwrite a valid version. Thus,**

there will always be a valid version of the data word preserved in the non-volatile memory" (paragraph 0013, line 14-17).

Therefore, it would have been obvious to combine Chambers with Brant for the benefit of having accurate backup data in a storage system as specified in claim 51.

8. Claims 17, 22, 25, 27-29 and 34 rejected under 35 U.S.C. 103(a) as being unpatentable over Brant (US 5799200) as applied to claims 1-3, 8-13, 16, 20, 35-36, 41-44, 47, 50, 52-54, 58 and 61 above, and further in view of Skagerwall (US 6473781).

As per claim 17, Brant discloses "The data storage system, as claimed in claim 16" **[With respect to this limitation, see rejection to claim 16 above];** but fails to disclose expressly "wherein said storage server comprises a storage server CPU."

Brant and Skagerwall are analogous art because they are from the same field of endeavor of data transfer methods and data storage system.

Skagerwall discloses "wherein said storage server comprises a storage server CPU." **[With respect to this limitation, Skagerwall discloses "components of the directory server DS1 are illustrated. The directory server DS1 comprises a central processing unit CPU for controlling operations of the directory server" (column 15, line 4-6)].**

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system wherein upon power interruption, copy data from a first volatile memory to a second non-volatile memory, and the system having a data server which navigates data to the first or second memory as described by Brant and determine that the server contains a CPU as taught by Skagerwall.

The motivation for doing so would have been because Skagerwall teaches that "**CPU for controlling operations of the directory server" (column 15, line 6-7) where it is understood that without the CPU, the server would not be able to control its operations.**

Therefore, it would have been obvious to combine Skagerwall with Brant for the benefit of being able to control the server's operations as specified in claim 17.

As per claim 22, Brant discloses "A data storage system, comprising: a block data storage device capable of storing block data to a first memory;" **[With respect to this limitation, Brant discloses "apparatus for preserving data that is stored in a volatile manner in a data processing system... employing a first volatile dynamic random access memory for storing said data" (column 11, line 14-19)];**

"a backup memory device comprising a backup non-volatile memory;" **[With respect to this limitation, Brant discloses "a single module containing both a DRAM and a Flash ROM" (column 2, line 19-23)];**

"and a block data storage processor interconnected to said block data storage device and said backup memory device, that is capable of: receiving block data to be written to said block data storage device, said block data comprising unique block addresses within said first memory and data to be stored at said unique block addresses;" **[With respect to this limitation, Brant discloses fig.1, where it is readily apparent that the processor is connected to storage devices, "Commands and data from the remote system are received by the interface devices 18A and 18B at terminals 19A and 19B which stores whatever is received in DRAM units 16 and 17 described below. Interface devices 18 then notify the processor 10 that these**

commands and/or data are stored" (column 3, line 62-67), and it is readily apparent that addresses are essentially unique and identifies the unique space to which a data is to be stored. It is understood that from the remote computer's perspective, there is a block data storage comprised of a multiplicity of disks and a backup memory device containing both a DRAM and a Flash ROM. It is also inherently apparent that a set of data is provided by the remote computer to both the block data storage device and the backup storage device];

"storing said block data in said backup memory device;" **[With respect to this limitation, Brant discloses "data is moved to Flash ROM" (column 6, line 7)];**

"and issuing one or more write commands to said block data storage device to write said block data to said first memory." **[With respect to this limitation, Brant discloses "Commands and data from the remote system are received by the interface devices 18A and 18B at terminals 19A and 19B which stores whatever is received in DRAM units" (column 3, line 62-65)];** but fails to disclose expressly "manipulating said block data, based on said unique block addresses, to enhance the efficiency of said block data storage device when the block data storage device stores said block data to said first memory;"

Skagerwall discloses "manipulating said block data, based on said unique block addresses, to enhance the efficiency of said block data storage device when the block data storage device stores said block data to said first memory;" **[With respect to this limitation, Skagerwall discloses "all object tags and directory server addresses may be numbered in an ascending order, tag data blocks of object tags with sequential numbers are stored on directory servers with sequential numbers and the list of all available directory servers, i.e.,**

their addresses, sorted by assigned numbers, are maintained as the hashtable" (column 5, line 10-15)].

Brant and Skagerwall are analogous art because they are from the same field of endeavor of data transfer methods and data storage system.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system to store data in two memories, one being a backup non-volatile device as described by Brant and determine to reorder block data to improve efficiency as taught by Skagerwall.

The motivation for doing so would have been because Skagerwall teaches that **["Advantageously, all object tags and directory server addresses may be numbered in an ascending order, tag data blocks of object tags with sequential numbers are stored on directory servers with sequential numbers and the list of all available directory servers, i.e., their addresses, sorted by assigned numbers, are maintained as the hashtable. Thus, the directory server storing information related to a particular one of the objects can be identified by the hashfunction" (column 5, line 10-17)].**

Therefore, it would have been obvious to combine Skagerwall with Brant for the benefit of improving the data backup system as specified in claim 22.

As per claim 25, The data storage system, as claimed in claim 22, wherein said backup memory device further comprises a backup volatile memory and a backup power source. **[With respect to this limitation, Brant discloses "an auxiliary battery power source" (column 13, line 21)].**

As per claim 27, Brant discloses "The data storage system, as claimed in claim 25, wherein said backup power source comprises a battery." **[With respect to this limitation, Brant discloses "At most, a small battery as an auxiliary power source" (column 2, lines 30-32)].**

As per claim 28, Brant discloses "The data storage system, as claimed in claim 25, wherein said backup memory device, upon detection of a power interruption, switches to said backup power source and receives power from said backup power source and moves said data from said backup volatile memory to said backup non-volatile memory." **[With respect to this limitation, Brant discloses "Thus, the power loss detection triggers a transfer of the data contained in the dynamic random access memory into the Flash ROM" (column 2, line 47-49), and "at most, a small battery as an auxiliary power source is used which only is active long enough to move data from the DRAM to the Flash ROM" (column 2, line 30-32)].**

As per claim 29, Brant discloses "The data storage system, as claimed in claim 28, wherein said backup memory device, upon detection of a power interruption, reads said data from said backup volatile memory, writes said data to said backup non-volatile memory, and verifies that said data stored in said backup non-volatile memory is correct." **[With respect to this limitation, Brant discloses "upon a power failure, a dump from the DRAM 51 to the Flash ROM 55 is effected" (column 6, line 24-25), and "Local controller 54 stores a "Save OK" bit on the Flash ROM 55 when it determines that a successful dump of the contents of DRAM 51 into Flash ROM 55 occurred. As seen in FIG. 5, the first thing that local**

controller 54 does is to check to see if the Save OK bit is set reflecting that data was previously saved in the Flash ROM 55 suitable for recovery" (column 6, line 36-41)].

As per claim 34, Brant discloses "The data storage system, as claimed in claim 22" **[With respect to this limitation, see rejection to claim 22 above];** but fails to disclose expressly "wherein said manipulating said block data comprises reordering said block data based on said unique block addresses such that seek time within said block data storage device is reduced."

Skagerwall discloses "wherein said manipulating said block data comprises reordering said block data based on said unique block addresses such that seek time within said block data storage device is reduced." **[With respect to this limitation, Skagerwall discloses "all object tags and directory server addresses may be numbered in an ascending order, tag data blocks of object tags with sequential numbers are stored on directory servers with sequential numbers and the list of all available directory servers, i.e., their addresses, sorted by assigned numbers, are maintained as the hashtable." (column 5, line 11-15)].**

Brant and Skagerwall are analogous art because they are from the same field of endeavor of data transfer methods and data storage system.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system wherein upon power interruption, copy data from a first volatile memory to a second non-volatile memory, and the system having a data server as described by Brant and determine that the server will reorder block data to improve efficiency as taught by Skagerwall.

The motivation for doing so would have been because Skagerwall teaches that **["Advantageously, all object tags and directory server addresses may be numbered in an ascending order, tag data blocks of object tags with sequential numbers are stored on directory servers with sequential numbers and the list of all available directory servers, i.e., their addresses, sorted by assigned numbers, are maintained as the hashtable. Thus, the directory server storing information related to a particular one of the objects can be identified by the hashfunction" (column 5, line 11-17)].**

Therefore, it would have been obvious to combine Skagerwall with Brant for the benefit of improving the data backup system as specified in claim 34.

9. Claims 23-24 rejected under 35 U.S.C. 103(a) as being unpatentable over Brant (US 5799200) as applied to claims 1-3, 8-13, 16, 20, 35-36, 41-44, 47, 50, 52-54, 58 and 61 above, and further in view of Skagerwall (US 6473781) and Jones (US 2002/0156983).

As per claim 23, Brant and Skagerwall disclose "The data storage system, as claimed in claim 22, wherein said block data storage device memory comprises a volatile write-back cache and a storage media capable storing said data." **[With respect to this limitation, Brant discloses "apparatus for preserving data that is stored in a volatile manner in a data processing system... employing a first volatile dynamic random access memory for storing said data" (column 11, line 14-19)];** but fails to disclose expressly "volatile write-back cache".

Jones discloses "volatile write-back cache" **[With respect to this limitation, Jones discloses "write back cache" (paragraph 000, line 2), where it is understood that the cache is volatile].**

Brant, Skagerwall and Jones are analogous art because they are from the same field of endeavor of data recovery between volatile and non-volatile storage system.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system to store data in two memories, one being a backup non-volatile device as described by Brant and determine to use a write-back cache as the volatile memory as taught by Jones.

The motivation for doing so would have been because Jones teaches that **"write back caches improve performance, because a write to the high-speed cache is faster than to the storage device" (paragraph 0004, line 7-9).**

Therefore, it would have been obvious to combine Jones with Brant and Skagerwall for the benefit of improving performance in a data backup system as specified in claim 23.

As per claim 24, Brant and Skagerwall discloses "The data storage system, as claimed in claim 23, wherein said block data storage device, upon receiving data to be stored on said storage media, stores said data in said volatile write-back cache and reports to said block data storage controller that said data has been stored at said block data storage device before storing said data on said storage media."

[With respect to this limitation, Brant discloses "The system appears to the remote computer as a single, large capacity, disk storage device. Commands and data from the remote system are received by the interface devices 18A and 18B at terminals 19A and 19B which stores whatever is received in DRAM units 16 and 17 described below. Interface

devices 18 then notify the processor 10 that these commands and/or data are stored" (column 3, line 60-67)]; but fails to disclose expressly "volatile write-back cache".

10. Claims 18-19 rejected under 35 U.S.C. 103(a) as being unpatentable over Brant (US 5799200) as applied to claims 1-3, 8-13, 16, 20, 35-36, 41-44, 47, 50, 52-54, 58 and 61 above, and further in view of Skagerwall (US 6473781) and Abe (US 2005/0228941).

As per claim 18, Brant and Skagerwall discloses "The data storage system, as claimed in claim 17" **[With respect to this limitation, see rejection to claim 17 above];** but fails to disclose expressly "wherein said storage server is capable of: receiving block data to be written to said first data storage device, said block data comprising unique block addresses within said first data storage device and data to be stored at said unique block addresses; storing said block data in said second data storage device; manipulating said block data, based on said unique block addresses, to enhance the efficiency of said first data storage device when said first data storage device stores said block data to said first data storage device memory; and issuing one or more write commands to said first data storage device to write said block data to said first data storage device memory."

Abe discloses "wherein said storage server is capable of: receiving block data to be written to said first data storage device, said block data comprising unique block addresses within said first data storage device and data to be stored at said unique block addresses;" **[With respect to this limitation, Abe discloses "Subsequently, the host interface portion 11 determines whether or not the data received from the host computer /server 1 can be written into the nonvolatile memory portion 22 (step 1104), and if writable (OK), the data**

is written to the address determined in step 1102 of the internal nonvolatile memory portion 22 by the data transfer control portion 21, and further write-protected from being deleted." (paragraph 0091, lines 1-8)];

"storing said block data in said second data storage device;" **[With respect to this limitation, Abe discloses "In parallel, whether or not the data from the host computer /server 1 can be written into the global cache memory portion 14 is determined (step 1105), and if writable (OK), the data is written into the address determined in step 1102 of the global cache memory portion 14 by the data transfer control portion 21." (paragraph 0091, lines 8-13)];**

"and issuing one or more write commands to said first data storage device to write said block data to said first data storage device memory." **[With respect to this limitation, Abe discloses "the data is written to the address determined in step 1102 of the internal nonvolatile memory portion 22 by the data transfer control portion 21, and further write-protected from being deleted." (paragraph 0091, lines 4-8)].**

Brant, Abe and Skagerwall are analogous art because they are from the same field of endeavor of data transfer methods and data storage system.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system wherein upon power interruption, copy data from a first volatile memory to a second non-volatile memory, and the system having a data server as described by Brant and determine that the server navigates data to the first or second memory as taught by Abe.

The motivation for doing so would have been because Abe teaches that **"data reliability can be maintained while corresponding to increases in processing speed of the device and enlargement in the size of the device" (paragraph 0018, line 5-7).**

Although Abe teaches writing data with the server, it does not clearly and specifically disclose "manipulating said block data, based on said unique block addresses, to enhance the efficiency of said first data storage device when said first data storage device stores said block data to said first data storage device memory". The motivation for doing so would have been because Skagerwall teaches that **["Advantageously, all object tags and directory server addresses may be numbered in an ascending order, tag data blocks of object tags with sequential numbers are stored on directory servers with sequential numbers and the list of all available directory servers, i.e., their addresses, sorted by assigned numbers, are maintained as the hashtable. Thus, the directory server storing information related to a particular one of the objects can be identified by the hashfunction" (column 5, line 11-18)].**

Therefore, it would have been obvious to combine Abe and Skagerwall with Brant for the benefit of improving the data backup system as specified in claim 18.

As per claim 19, Brant discloses "The data storage system, as claimed in claim 18," **[With respect to this limitation, see rejection to claim 18 above];** but fails to disclose expressly "wherein said manipulating said block data comprises reordering said block data based on said unique block addresses such that seek time within said first data storage device is reduced."

Skagerwall discloses "wherein said manipulating said block data comprises reordering said block data based on said unique block addresses such that seek time within said first data storage device is reduced." **[With respect to this limitation, Skagerwall discloses "all object tags and directory server addresses may be numbered in an ascending order, tag data blocks of object tags with sequential numbers are stored on directory servers with sequential numbers and the list of all available directory servers, i.e., their addresses, sorted by assigned numbers, are maintained as the hashtable." (column 5, line 11-16)].**

Brant, Abe and Skagerwall are analogous art because they are from the same field of endeavor of data transfer methods and data storage system.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system wherein upon power interruption, copy data from a first volatile memory to a second non-volatile memory, and the system having a data server as described by Brant and determine that the server will reorder block data to improve efficiency as taught by Skagerwall.

The motivation for doing so would have been because Skagerwall teaches that **["Advantageously, all object tags and directory server addresses may be numbered in an ascending order, tag data blocks of object tags with sequential numbers are stored on directory servers with sequential numbers and the list of all available directory servers, i.e., their addresses, sorted by assigned numbers, are maintained as the hashtable. Thus, the directory server storing information related to a particular one of the objects can be identified by the hashfunction" (column 5, line 10-17)].**

Therefore, it would have been obvious to combine Skagerwall and Abe with Brant for the benefit of improving the data backup system as specified in claim 19.

11. Claim 26 rejected under 35 U.S.C. 103(a) as being unpatentable over Brant (US 5799200) as applied to claims 1-3, 8-13, 16, 20, 35-36, 41-44, 47, 50, 52-54, 58 and 61 above, and further in view of Skagerwall (US 6473781) and Purkey (US 2002/0041174).

As per claim 26, Brant and Skagerwall fail to disclose expressly "wherein said backup power source comprises a capacitor."

Purkey discloses "wherein said secondary power source comprises a capacitor." **[With respect to this limitation, Purkey discloses "the power source 20 of the present invention is preferably provided by a high-density capacitor 22" (paragraph 0065, lines 1-3)].**

Brant, Skagerwall and Purkey are analogous art because they are from the same field of endeavor of auxiliary power system usage.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data storage system where upon power interruption, copy data from a first volatile memory to a second non-volatile memory and using a secondary power source as described by Brant and determine that the power source is a capacitor as taught by Purkey.

The motivation for doing so would have been because Purkey teaches that **"the capacitor 22 and battery combination 24 of the power source provide a significant advantage over other conventional power source" (paragraph 0066, line 26)].**

Therefore, it would have been obvious to combine Purkey, Skagerwall with Brant for the benefit of improving performance in a data backup system as specified in claim 26.

12. Claim 30-33 rejected under 35 U.S.C. 103(a) as being unpatentable over Brant (US 5799200) as applied to claims 1-3, 8-13, 16, 20, 35-36, 41-44, 47, 50, 52-54, 58 and 61 above, and further in view of Skagerwall (US 6473781) and Chambers (US 2004/0138855).

As per claim 30, Brant and Skagerwall disclose "wherein said backup memory device, upon detection of a power interruption, reads said data from said backup volatile memory" **[With respect to this limitation, Brant discloses "the power loss detection triggers a transfer of the data contained in the dynamic random access memory into the Flash ROM" (column 2, line 47-49), where it is readily understood that a transfer of the data involves reading data from volatile memory];** but fails to disclose "computes an ECC for said data, and writes said data and said ECC to said backup non-volatile memory. "

Chambers discloses "computes an ECC for said data, and writes said data and said ECC to said backup non-volatile memory. " **[With respect to this limitation, Chambers discloses "whenever each version of the data word is backed up to the non-volatile memory, an associated error correction code ('ECC') is computed and backed up along with the data word" (paragraph 0041, line 1-4)].**

Brant, Skagerwall and Chambers are analogous art because they are from the same field of endeavor of data backup.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system wherein upon power interruption, copy data from a first volatile memory to a second non-volatile memory as described by Brant and determine to

calculate ECC for data read from volatile memory and write ECC along with data into non-volatile memory as taught by Chambers .

The motivation for doing so would have been because Chambers teaches that **"in this way, even if the back up proves unsuccessful it will not overwrite a valid version. Thus, there will always be a valid version of the data word preserved in the non-volatile memory" (paragraph 0013, line 14-17).**

Therefore, it would have been obvious to combine Chambers with Brant and Skagerwall for the benefit of having accurate backup data in a storage system as specified in claim 30.

As per claim 31, Brant discloses "The data storage system, as claimed in claim 30, wherein said backup memory device upon detection of power restoration following the power interruption, said data is moved from said backup non-volatile memory to said backup volatile memory." **[With respect to this limitation, Brant discloses "Once it is recognized that the primary power source is again supplying power to the system, the method in accordance with the present invention includes the step of returning the data from the Flash ROM to the original DRAM" (column 3, line 8-11)].**

As per claim 32, Brant and Skagerwall discloses "wherein said backup memory device reads data from said backup non-volatile memory" **[With respect to this limitation, Brant discloses "a transfer of the data contained in the dynamic random access memory into the Flash ROM" (column 2, line 47), where it is readily understood that a transfer of the data involves reading data from volatile memory];** but fails to disclose expressly "computes an

ECC for said data, compares said computed ECC to said ECC written to said backup non-volatile memory, and writes said data to said data to said volatile memory."

Chambers discloses "computes an ECC for said data, compares said computed ECC to said ECC written to said backup non-volatile memory, and writes said data to said data to said volatile memory." **[With respect to this limitation, Chambers discloses "whenever each version of the data word is backed up to the non-volatile memory, an associated error correction code ('ECC') is computed and backed up along with the data word" (paragraph 0041, line 1), and "The controller then checks the validity of the retrieved N-bit data word by computing its ECC as ECCR and comparing it to the retrieved ECCM" (paragraph 0067, line 7-11)].**

Brant, Skagerwall and Chambers are analogous art because they are from the same field of endeavor of data backup.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system wherein upon power interruption, copy data from a first volatile memory to a second non-volatile memory as described by Brant and determine to calculate ECC for data read from volatile memory and write ECC along with data into non-volatile memory, and to compare ECC codes as taught by Chambers .

The motivation for doing so would have been because Chambers teaches that **"in this way, even if the back up proves unsuccessful it will not overwrite a valid version. Thus, there will always be a valid version of the data word preserved in the non-volatile memory" (paragraph 0013, line 14).**

Therefore, it would have been obvious to combine Chambers with Brant and Skagerwall for the benefit of having accurate backup data in a storage system as specified in claim 32.

As per claim 33, Brant discloses "The data storage system, as claimed in claim 31 wherein said block data storage device comprises a plurality of hard disk drives, and wherein said block data storage processor is further capable to write an identifier to each of said hard disk drives identifying said backup memory device, and wherein said block data storage processor verifies that said identifier is present on each of said hard disk drives following the power restoration. **[With respect to this limitation, Brant discloses "a multiplicity of disks" (column 3, line 49), "the system appears to the remote computer as a single, large capacity, disk storage device" (column 3, line 60-62), "the placing of a sequence number of the disk" (column 7, line 28), "if power returns and the DRAM content is restored, the software knows if it has recovered this data previously. The way the software determines this is by checking the unique sequence number stored" (column 7, line 34-37)].**

13. Claims 48-49, and 62-63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brant (US 5799200) as applied to claims 1-3, 8-13, 16, 20, 35-36, 41-44, 47, 50, 52-54, 58 and 61 above, and further in view of Skagerwall (US 6473781) and Abe (US 2005/0228941) and Smith (US 4774659).

As per claim 48, Brant fails to disclose expressly "wherein said block data storage controller comprises an operating system and a block storage processor that is capable of: receiving block data to be written to said first data storage device, said block data comprising

unique block addresses within said first data storage device and data to be stored at said unique block addresses; storing said block data in said second data storage device; manipulating said block data, based on said unique block addresses, to enhance the efficiency of said first data storage device when said first data storage device stores said block data to said first data storage device memory; and issuing one or more write commands to said first data storage device to write said block data to said first data storage device memory."

Skagerwall discloses "wherein said block data storage controller comprises ... a block storage processor" **[With respect to this limitation, Skagerwall discloses "components of the directory server DS1 are illustrated. The directory server DS1 comprises a central processing unit CPU for controlling operations of the directory server" (column 15, line 4-7)];**

"manipulating said block data, based on said unique block addresses, to enhance the efficiency of said first data storage device when said first data storage device stores said block data to said first data storage device memory;" **[With respect to this limitation, Brant discloses "all object tags and directory server addresses may be numbered in an ascending order, tag data blocks of object tags with sequential numbers are stored on directory servers with sequential numbers and the list of all available directory servers, i.e., their addresses, sorted by assigned numbers, are maintained as the hashtable." (column 5, line 11-16)];** but fails to disclose "an operating system", "receiving block data to be written to said first data storage device, said block data comprising unique block addresses within said first data storage device and data to be stored at said unique block addresses; storing said block data in said second

data storage device; and issuing one or more write commands to said first data storage device to write said block data to said first data storage device memory".

Although Skagerwall teaches using a CPU for a controller and manipulating addresses for enhancing storage, it does not clearly and specifically disclose "an operating system", "receiving block data to be written to said first data storage device, said block data comprising unique block addresses within said first data storage device and data to be stored at said unique block addresses; storing said block data in said second data storage device; and issuing one or more write commands to said first data storage device to write said block data to said first data storage device memory".

Abe discloses "receiving block data to be written to said first data storage device, said block data comprising unique block addresses within said first data storage device and data to be stored at said unique block addresses;" **[With respect to this limitation, Abe discloses "Subsequently, the host interface portion 11 determines whether or not the data received from the host computer /server 1 can be written into the nonvolatile memory portion 22 (step 1104), and if writable (OK), the data is written to the address determined in step 1102 of the internal nonvolatile memory portion 22 by the data transfer control portion 21, and further write-protected from being deleted." (paragraph 0091)];**

"storing said block data in said second data storage device;" **[With respect to this limitation, Abe discloses "In parallel, whether or not the data from the host computer /server 1 can be written into the global cache memory portion 14 is determined (step 1105), and if writable (OK), the data is written into the address determined in step 1102 of the global cache memory portion 14 by the data transfer control portion 21." (paragraph 0091)];**

"and issuing one or more write commands to said first data storage device to write said block data to said first data storage device memory." **[With respect to this limitation, Abe discloses "the data is written to the address determined in step 1102 of the internal nonvolatile memory portion 22 by the data transfer control portion 21, and further write-protected from being deleted." (paragraph 0091)].**

Smith discloses "an operating system" **[With respect to this limitation, Smith discloses "operating system"].**

Brant, Abe, Skagerwall, and Smith are analogous art because they are from the same field of endeavor of data transfer methods and data storage system.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system wherein upon power interruption, copy data from a first volatile memory to a second non-volatile memory, and the system having a data server as described by Brant and determine that the server contains a CPU and manipulates data based on address to enhance the efficiency of the storage device as taught by Skagerwall.

The motivation for doing so would have been because Skagerwall teaches that "**CPU for controlling operations of the directory server" (column 15, line 6-7) where it is understood that without the CPU, the server would not be able to control its operations, and ["Advantageously, all object tags and directory server addresses may be numbered in an ascending order, tag data blocks of object tags with sequential numbers are stored on directory servers with sequential numbers and the list of all available directory servers, i.e., their addresses, sorted by assigned numbers, are maintained as the hashtable. Thus, the**

directory server storing information related to a particular one of the objects can be identified by the hashfunction" (column 5, line 10-18)].

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system wherein upon power interruption, copy data from a first volatile memory to a second non-volatile memory, and the system having a data server as described by Brant and determine that the server navigates data to the first or second memory as taught by Abe.

The motivation for doing so would have been because Abe teaches that **"data reliability can be maintained while corresponding to increases in processing speed of the device and enlargement in the size of the device" (paragraph 0018, line 5)**.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system wherein upon power interruption, copy data from a first volatile memory to a second non-volatile memory, and the system having a data server as described by Brant and determine that the server maintains a operating system as taught by Smith.

The motivation for doing so would have been because Smith teaches that **"such an operating system provides advantageous networking support, accommodates virtual memory, and provides 'Fast Filesystem'" (column 21, line 56-58).**

Therefore, it would have been obvious to combine Abe, Smith and Skagerwall with Brant for the benefit of improving the data backup system as specified in claim 48.

As per claim 49, Brant fails to disclose "wherein said manipulating said block data comprises reordering said block data based on said unique block addresses such that seek time within said first data storage device is reduced."

Skagerwall discloses "wherein said manipulating said block data comprises reordering said block data based on said unique block addresses such that seek time within said first data storage device is reduced." **[With respect to this limitation, Skagerwall discloses "all object tags and directory server addresses may be numbered in an ascending order, tag data blocks of object tags with sequential numbers are stored on directory servers with sequential numbers and the list of all available directory servers, i.e., their addresses, sorted by assigned numbers, are maintained as the hashtable." (column 5, line 11-16)].**

Brant, Abe, Smith and Skagerwall are analogous art because they are from the same field of endeavor of data transfer methods and data storage system.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system wherein upon power interruption, copy data from a first volatile memory to a second non-volatile memory, and the system having a data server as described by Brant and determine that the server will reorder block data to improve efficiency as taught by Skagerwall.

The motivation for doing so would have been because Abe teaches that Skagerwall teaches that **["Advantageously, all object tags and directory server addresses may be numbered in an ascending order, tag data blocks of object tags with sequential numbers are stored on directory servers with sequential numbers and the list of all available directory servers, i.e., their addresses, sorted by assigned numbers, are maintained as the**

hashtable. Thus, the directory server storing information related to a particular one of the objects can be identified by the hashfunction" (column 5, line 11-18)].

Therefore, it would have been obvious to combine Skagerwall with Brant for the benefit of improving the data backup system as specified in claim 49.

As per claim 62, Brant fails to disclose expressly "wherein said block data storage server comprises an operating system and a block storage processor that is capable of: receiving block data to be written to said primary data storage device, said block data comprising unique block addresses within said primary data storage device and data to be stored at said unique block addresses; storing said block data in said second data storage device; manipulating said block data, based on said unique block addresses, to enhance the efficiency of said primary data storage device when said primary data storage device stores said block data to said primary data storage device memory; and issuing one or more write commands to said primary data storage device to write said block data to said primary data storage device memory."

Skagerwall discloses ""wherein said block data storage server comprises ... a block storage processor that is capable of:" **[With respect to this limitation, Skagerwall discloses "components of the directory server DS1 are illustrated. The directory server DS1 comprises a central processing unit CPU for controlling operations of the directory server" (column 15, line 4-7)];**

"manipulating said block data, based on said unique block addresses, to enhance the efficiency of said primary data storage device when said primary data storage device stores said block data to said primary data storage device memory;" **[With respect to this limitation, Brant discloses**

"all object tags and directory server addresses may be numbered in an ascending order, tag data blocks of object tags with sequential numbers are stored on directory servers with sequential numbers and the list of all available directory servers, i.e., their addresses, sorted by assigned numbers, are maintained as the hashtable." (column 5, line 10-16)].

Although Skagerwall teaches using a CPU for a controller and manipulating addresses for enhancing storage, it does not clearly and specifically disclose "an operating system", "receiving block data to be written to said primary data storage device, said block data comprising unique block addresses within said primary data storage device and data to be stored at said unique block addresses; storing said block data in said second data storage device; and issuing one or more write commands to said primary data storage device to write said block data to said primary data storage device memory."

Abe discloses "receiving block data to be written to said primary data storage device, said block data comprising unique block addresses within said primary data storage device and data to be stored at said unique block addresses;" **[With respect to this limitation, Abe discloses "Subsequently, the host interface portion 11 determines whether or not the data received from the host computer /server 1 can be written into the nonvolatile memory portion 22 (step 1104), and if writable (OK), the data is written to the address determined in step 1102 of the internal nonvolatile memory portion 22 by the data transfer control portion 21, and further write-protected from being deleted." (paragraph 0091)];**

"storing said block data in said second data storage device;" **[With respect to this limitation, Abe discloses "In parallel, whether or not the data from the host computer /server 1 can be written into the global cache memory portion 14 is determined (step 1105), and if writable**

(OK), the data is written into the address determined in step 1102 of the global cache memory portion 14 by the data transfer control portion 21." (paragraph 0091)];

"and issuing one or more write commands to said primary data storage device to write said block data to said primary data storage device memory." **[With respect to this limitation, Abe discloses "the data is written to the address determined in step 1102 of the internal nonvolatile memory portion 22 by the data transfer control portion 21, and further write-protected from being deleted." (paragraph 0091)].**

Smith discloses "an operating system" **[With respect to this limitation, Smith discloses "operating system"].**

Brant, Abe, Skagerwall and Smith are analogous art because they are from the same field of endeavor of data transfer methods and data storage system.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system wherein upon power interruption, copy data from a first volatile memory to a second non-volatile memory, and the system having a data server as described by Brant and determine that the server contains a CPU and manipulates data based on address to enhance the efficiency of the storage device as taught by Skagerwall.

The motivation for doing so would have been because Skagerwall teaches that "**CPU for controlling operations of the directory server" (column 15, line 6-7) where it is understood that without the CPU, the server would not be able to control its operations, and ["Advantageously, all object tags and directory server addresses may be numbered in an ascending order, tag data blocks of object tags with sequential numbers are stored on directory servers with sequential numbers and the list of all available directory servers, i.e.,**

their addresses, sorted by assigned numbers, are maintained as the hashtable. Thus, the directory server storing information related to a particular one of the objects can be identified by the hashfunction" (column 5, line 10-18)].

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system wherein upon power interruption, copy data from a first volatile memory to a second non-volatile memory, and the system having a data server as described by Brant and determine that the server navigates data to the first or second memory as taught by Abe.

The motivation for doing so would have been because Abe teaches that **"data reliability can be maintained while corresponding to increases in processing speed of the device and enlargement in the size of the device" (paragraph 0018, line 5-7).**

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system wherein upon power interruption, copy data from a first volatile memory to a second non-volatile memory, and the system having a data server as described by Brant and determine that the server maintains a operating system as taught by Smith.

The motivation for doing so would have been because Smith teaches that **"such an operating system provides advantageous networking support, accommodates virtual memory, and provides 'Fast Filesystem'" (column 21, line 56-58).**

Therefore, it would have been obvious to combine Abe, Smith and Skagerwall with Brant for the benefit of improving the data backup system as specified in claim 62.

As per claim 63, Brant fails to disclose expressly "wherein said manipulating said block data comprises reordering said block data based on said unique block addresses such that seek time within said primary data storage device is reduced,"

Skagerwall discloses "wherein said manipulating said block data comprises reordering said block data based on said unique block addresses such that seek time within said primary data storage device is reduced." **[With respect to this limitation, Skagerwall discloses "all object tags and directory server addresses may be numbered in an ascending order, tag data blocks of object tags with sequential numbers are stored on directory servers with sequential numbers and the list of all available directory servers, i.e., their addresses, sorted by assigned numbers, are maintained as the hashtable." (column 5, line 11-16)].**

Brant, Abe and Skagerwall are analogous art because they are from the same field of endeavor of data transfer methods and data storage system.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify a data backup system wherein upon power interruption, copy data from a first volatile memory to a second non-volatile memory, and the system having a data server as described by Brant and determine that the server will reorder block data to improve efficiency as taught by Skagerwall.

The motivation for doing so would have been because Abe teaches that Skagerwall teaches that ["**Advantageously, all object tags and directory server addresses may be numbered in an ascending order, tag data blocks of object tags with sequential numbers are stored on directory servers with sequential numbers and the list of all available directory servers, i.e., their addresses, sorted by assigned numbers, are maintained as the**

hashtable. Thus, the directory server storing information related to a particular one of the objects can be identified by the hashfunction" (column 5, line 11-18)].

Therefore, it would have been obvious to combine Skagerwall with Brant for the benefit of improving the data backup system as specified in claim 63.

Arguments Concerning Prior Art Rejections

Point of Argument for all Claims

14. With respect to the arguments of Applicant's Remarks, the Applicant argues that Brant fails to teach a capacitor that provides secondary power. The argument is based on amended claims, and the Examiner answers Applicant's arguments in the rejection based on prior arts.

Conclusion

15. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Victor W. Wang whose telephone number is (571) 272-9771. The examiner can normally be reached on Monday through Friday, 8:30am - 6:00pm. E.S.T..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Reginald Bragdon can be reached on (571) 272-4204. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Victor Wang
6 January 2008
Patent Examiner
Art Unit 2189

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SUPERVISORY PATENT EXAMINER